

## **REMARKS**

At the outset, Applicant would like to thank the Examiner for the time taken and courtesies extended in the telephonic interview conducted on or about May 23, 2003. In that interview, various aspects of diffraction gratings were discussed, and the specific definition of a Littrow configuration was investigated. Since that interview, Applicant has done additional research into the issue. As will be explained below, the Examiner's definition of a Littrow configuration is correct, but incomplete. The complete definition of a Littrow configuration connects the angle of incidence of the incoming light to the blaze angle of the blaze flank. Because of this connection, a Littrow configuration requires the incoming light to impact the blaze flank at an angle of 90 degrees. As such, Staunton '532 cannot disclose a diffraction grating as claimed in the present invention, because it cannot satisfy the Littrow condition, while mailing a biplanar counter flank, of a single planar blaze flank.

In the last Office Action, mailed on October 22, 2002, the Examiner rejected Claims 1, 3-6 and 10-12 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 3,045,532, issued to Staunton (Staunton '532). Specifically, the Examiner stated that Staunton '532 disclosed a grating with a blaze flank (identified by the Examiner as 1-2) at an angle that satisfies the Littrow condition. The Examiner based this rejection, however, on the assumption that, in a Littrow configuration, any angle for the incident angle of light will be acceptable.

Specifically, in the telephonic interview, the Examiner relied upon an equation (Equation 2-3) from The Diffraction Grating Handbook, found at [www.gratinglab.com/library/handbook/chapter2.asp](http://www.gratinglab.com/library/handbook/chapter2.asp), to support his assumption. That equation reads:

$$2d\sin(\alpha) = m\lambda$$

The equation cited by the Examiner is correct in that a diffraction grating is placed in a Littrow configuration when the incident angle of light ( $\alpha$ ) is equal to the angle of diffraction ( $\beta$ ) of a certain diffraction order ( $m$ ). The equation cited by the Examiner is the simplified Grating Equation, and thus is ultimately accurate. The equation, however, is incomplete. The Littrow Configuration additionally requires that the blaze angle ( $\theta$ ) of the diffraction grating is equal to the angle of incidence ( $\alpha$ ) and the angle of diffraction ( $\beta$ ). Thus, in a Littrow configuration:

$$\alpha = \beta = \theta$$

This definition can be seen in some of the references cited during the present prosecution. For example, in PCT Publication No. WO 00/16134 (PCT '134), on Page 2, a Littrow configuration is described in more detail. Specifically, it states that:

Figure 1 shows a cross-section of an echelle grating in the Littrow configuration. Grating 100 includes parallel grooves 110, each with two facets and having a groove spacing  $d$ . Facet 120 is located at a blaze angle  $\theta$  with respect to the plane of the grating. When the angle of incidence  $\alpha$  is equal to the diffraction grating angle  $\beta$  **and the blaze angle  $\theta$** , incident light 130 is diffracted in a given diffraction order 140 (i.e. the  $m$ -th order) which propagates backward toward the source.

(PCT '134, Page 2) (emphasis added).

The connection between the blaze angle of the diffraction grating and the incident angle of the light is essential to the Littrow configuration. By fixing the incoming angle of light to the blaze angle of the diffraction grating, the angle of incidence and the angle of diffraction become

fixed quantities. In fact, by connecting the blaze angle to the angle of incidence, the light can only be incident on the blaze flank at 90 degrees.

To that end, reference is made to the enclosed figures, which depict the geometrical analysis associating the angle of incidence relative to the grating ( $\alpha$ ), the blaze angle ( $\theta$ ) and the angle of incidence relative to the blaze ( $\gamma$ ). First, in Fig. 1 it is shown that the angle of incidence ( $\gamma$ ) of the incident light on the blaze flank is equivalent to the angle of incidence of the light ( $\alpha$ ) plus the angle ( $90-\theta$ ). Thus, by simple geometry, the incident angle of light relative to the blaze flank can be calculated from:

$$90 - \theta + \alpha = \gamma$$

If we set the angle of incident light ( $\alpha$ ) equivalent to the blaze angle ( $\theta$ ), then the incident angle of light with respect to the blaze flank will always equal 90 degrees.

From the above, it is clear that a Littrow configuration, which requires the incident angle of light to be the same as the diffracted angle of light and the blaze angle (i.e.  $\alpha = \beta = \theta$ ), also requires the impinging light to impact the blaze flank at an angle of 90 degrees. In other words, in a Littrow configuration, the impacting light is always perpendicular to the blaze flank.

Based on the above, Applicant submits that the Examiner's original understanding of what comprises a Littrow configuration for a diffraction grating was incomplete. The Examiner originally contended that Staunton '532 taught the present invention as claimed because an angle of light can impact the 1-2 flank of Staunton '532, without impacting either the 2-3 or the 3-1' flanks, as shown in Fig. 2. Further, the Examiner also contended that, under Equation 2-3 from The Diffraction Grating Handbook, any angle of incident light can satisfy the Littrow condition,

and thus the angle of impact shown in Fig. 3, in the Examiner's opinion, could comprise a Littrow configuration.

As can be clearly seen in Fig. 2, however, the incoming light does not impact the 1-2 flank at a 90 degree angle. Furthermore, any incident light that did in fact impact the 1-2 flank, or the 2-3 flank at a 90 degree angle, such as that shown in Fig. 3, would always impact the corresponding flank (2-3 or 1-2 relatively). Therefore, the diffraction grating in Staunton '532 can never comprise, among other things, a "Littrow grating . . . [with] a blaze flank inclined towards the base area substantially at the Littrow angle and a counter-flank . . . [which] comprises at least two substantially plane area sections . . . ."

Claim 1, on the other hand, specifically recites a single blaze flank and a bi-planar counter flank in a Littrow configuration. Not only is the grating itself labeled as a "Littrow grating," but the blaze flank is specifically recited as being "inclined towards the base area substantially at the Littrow angle . . . ." The inclination of the blaze flank, shown as the angle  $\theta$  in the original figures in the application, and specifically in Fig. 1 of the application, is thus directly equivalent to the incident angle of light ( $\alpha$ ) and the diffracted angle of light ( $\beta$ ), as is required under Littrow conditions.

Claim 1 recites conditions that result in a specific diffraction grating structure that is not and cannot be shown in Staunton '532. As such, Claim 1 should be in allowable condition as written. However, in order to further clarify that Claim, Applicant has amended Claim 1 to specify that the blaze flank is a planar blaze flank. Again, in combination with the requirement that the diffraction grating be in a Littrow configuration, the device as claimed in Claim 1 is not taught, disclosed or suggested by any of the cited art.

Based on the above, Applicant submits that Claim 1 is now in allowable condition as written. Further, the remaining claims in the application, namely claims 2-12, all depend from Claim 1, and should also be in condition for allowance. Therefore, reconsideration and passage to allowance of all claims is respectfully requested.

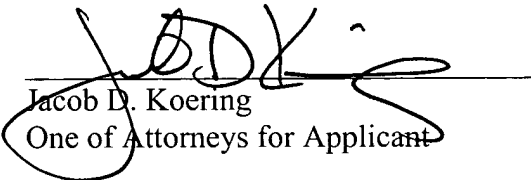
Given the complexities of the analysis above, Applicant would respectfully request a telephone call to the undersigned upon receipt and review of the present communication.

Should anything further be required, a telephone call to the undersigned, at (312) 226-1818, is respectfully invited.

Respectfully submitted,

FACTOR & PARTNERS, LLC

Dated: July 7, 2003

  
Jacob D. Koering  
One of Attorneys for Applicant

**CERTIFICATE OF MAILING**

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on July 7, 2003.

Jacob D. Koering  
